

J-SCOPE (JISAO's Seasonal Coastal Ocean Prediction of the Ecosystem): seasonal ocean forecasts for fisheries management



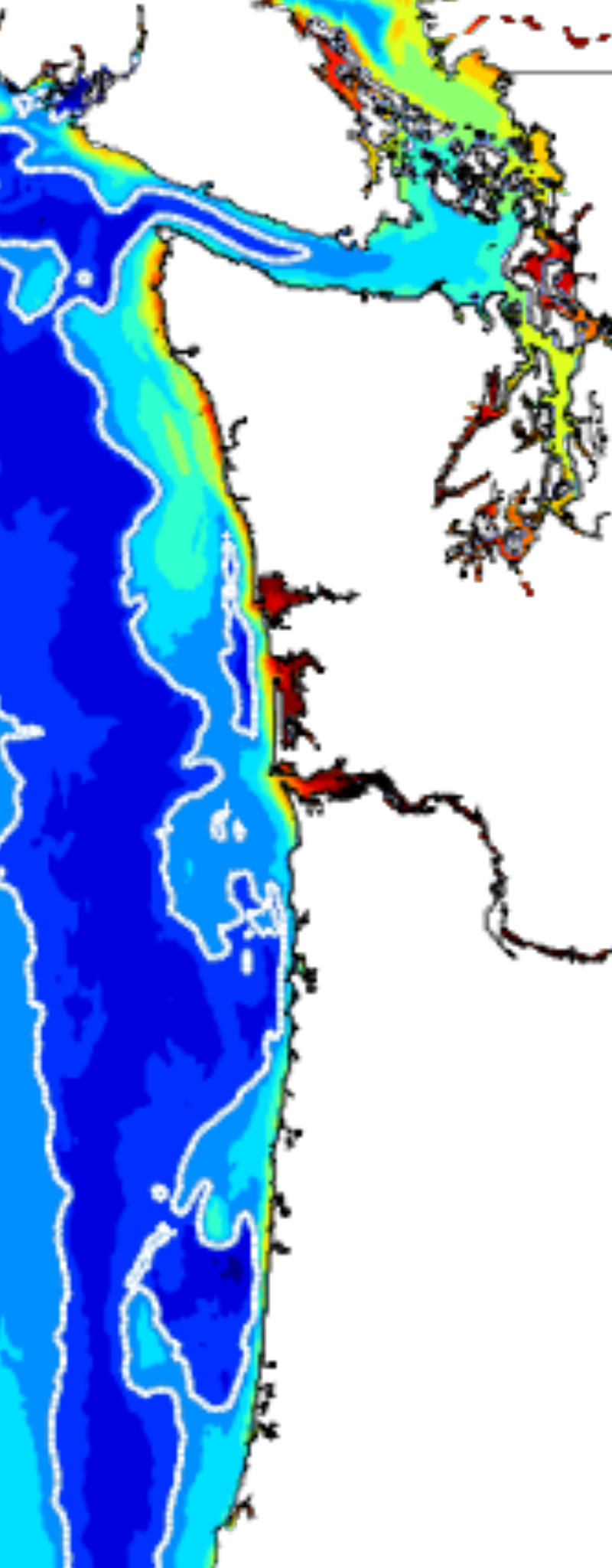
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Tam Nguyen, Jan Newton, Simone Alin



Check out our website:
<http://www.nanoos.org/products/j-scope/home.php>

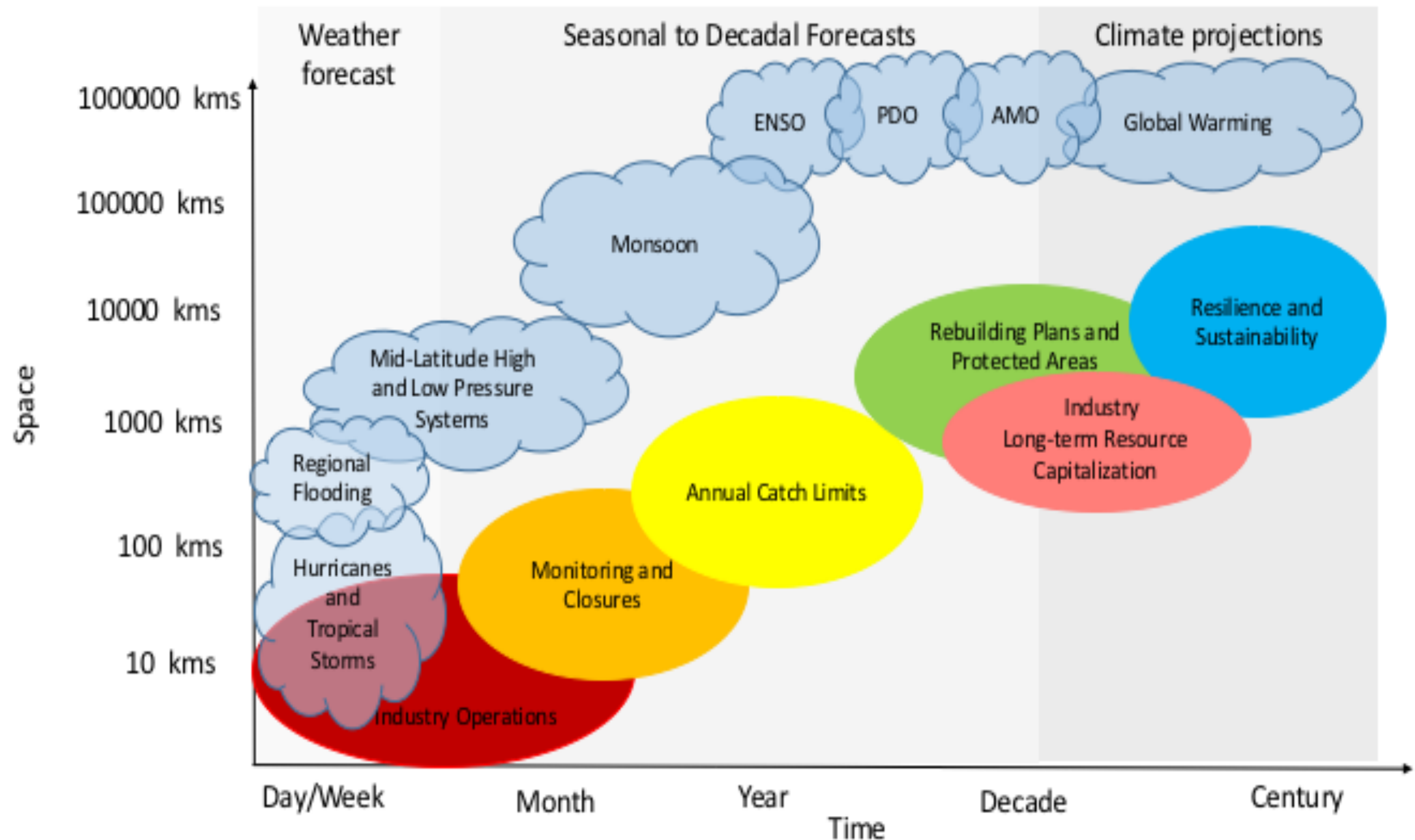




Goal: forecast up to 6-9 months of California Current ocean conditions

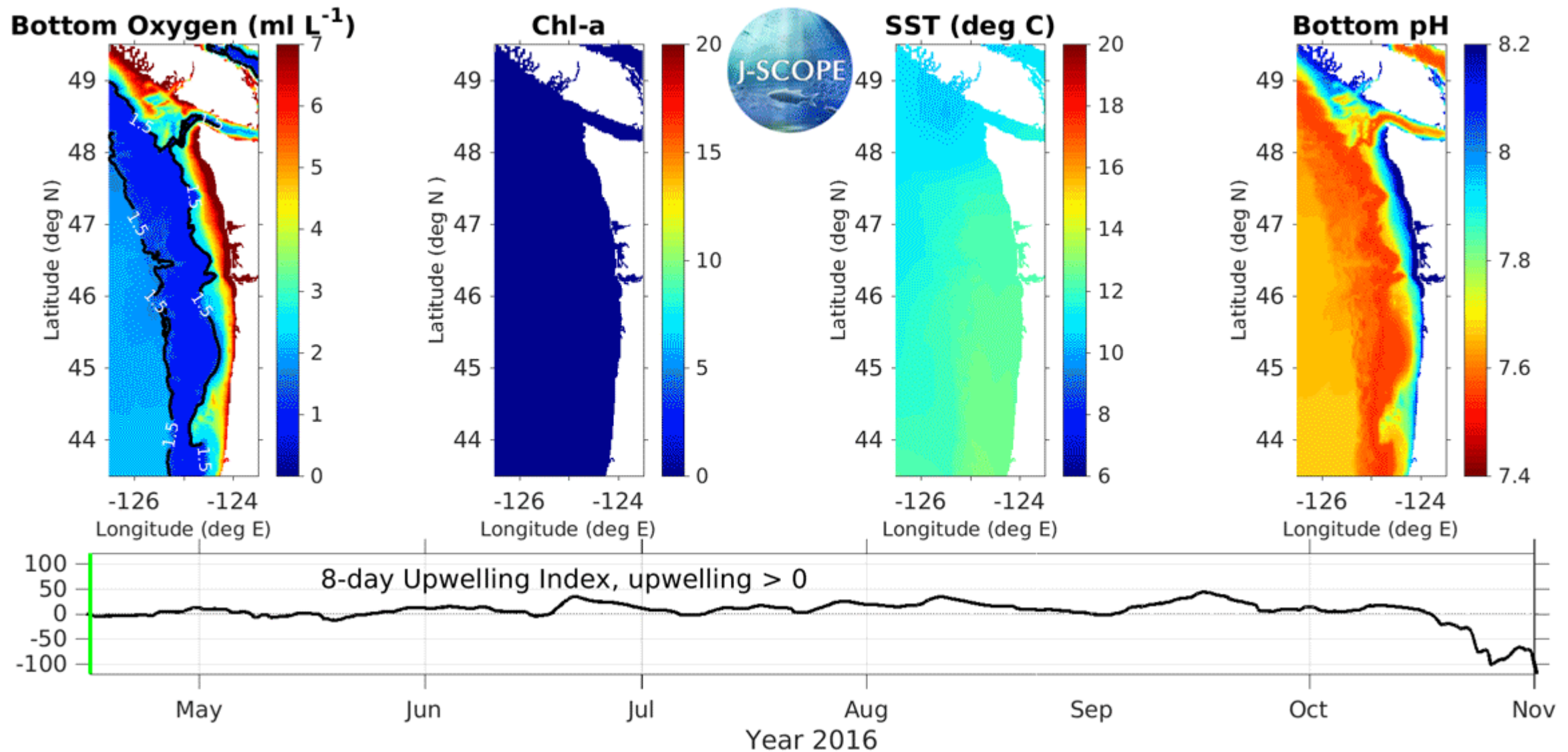
- Climate Forecast System (**CFS**) for coarse scale (50km) predictions of ocean physics, 6-9 months in advance
- Regional Ocean Modeling System (**ROMS**) is available to downscale these results salmon, and coastal pelagic species

Marine resource management decisions across space and time scales



Tommasi et al., (in revision)

April 2016 forecast



<http://www.nanoos.org/products/j-scope/forecasts.php>

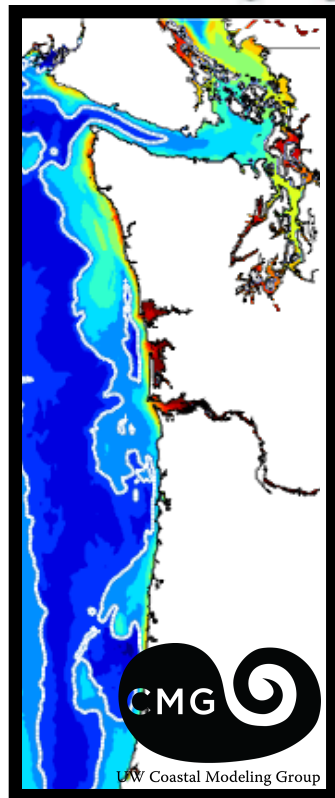
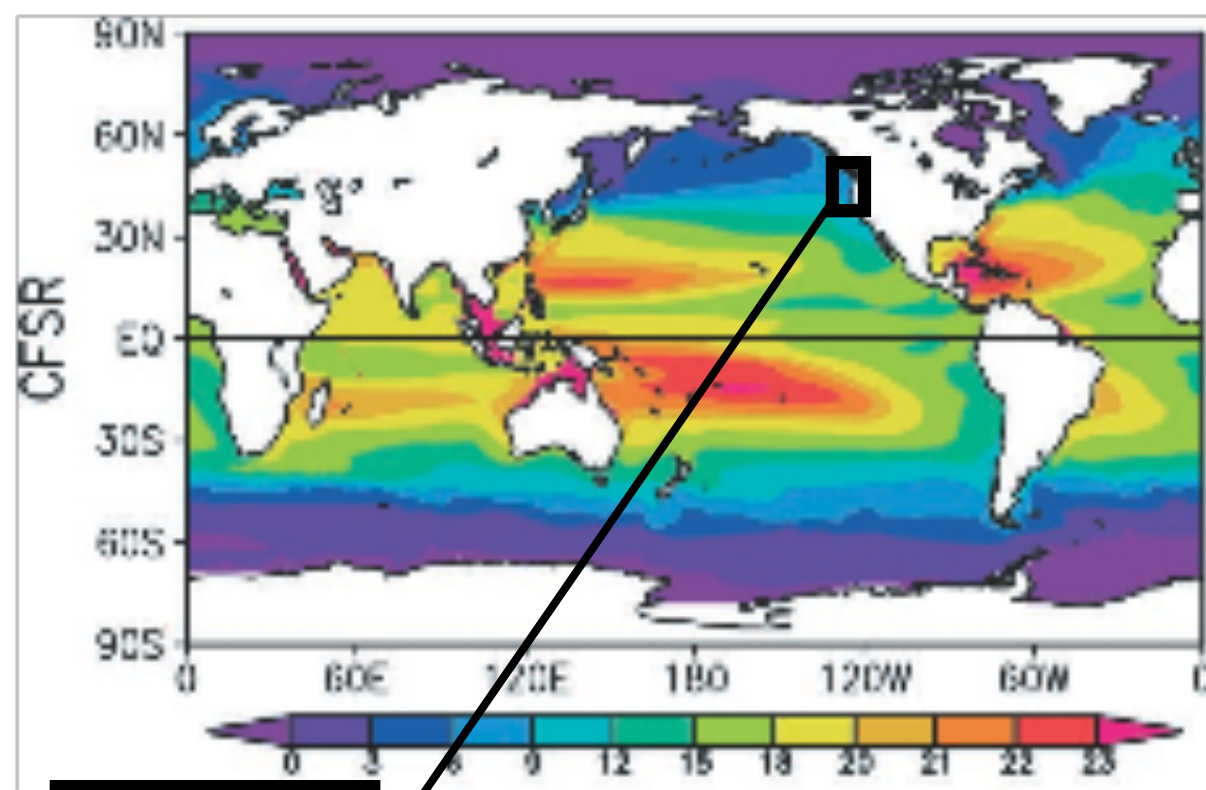
Building a Forecast System

Climate Forecast System (CFS) - ocean boundary conditions and atmospheric forcing (Ocean: ~50km, Atm: ~200km resolution)

CFS + UW CMG regional ROMS-based model with biogeochemistry (~1.5 km resolution, 40 vertical levels, with rivers and tides)

Empirical relationships from observations applied to the modeled fields to take those forecasts to the ocean health indices :

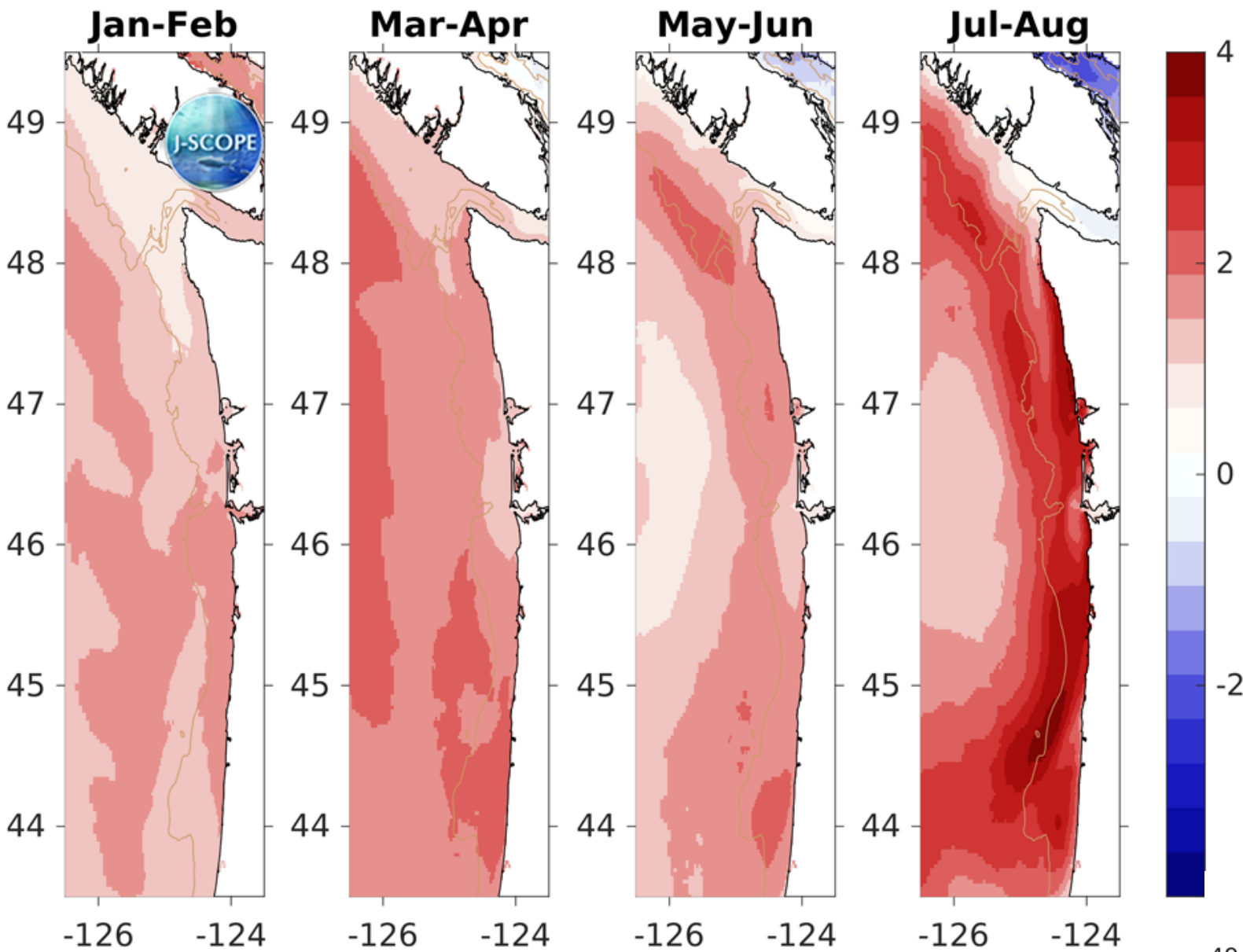
- pH (Alin et al, in prep; Alin et al, 2012)
- sardines (Kaplan et al, 2016)



UW Cascadia Model setup

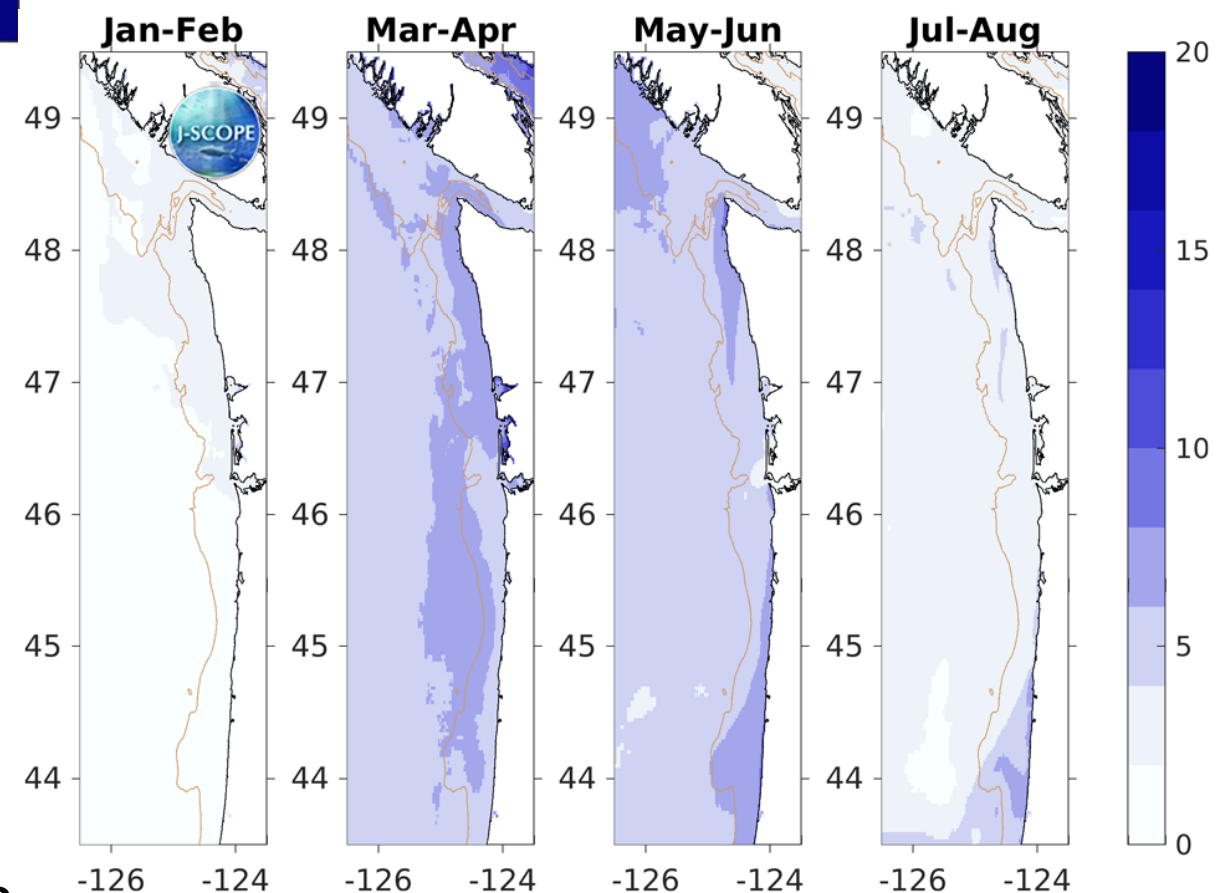
<http://faculty.washington.edu/pmac/cm/cm/cm.html>

and Giddings et al, 2014



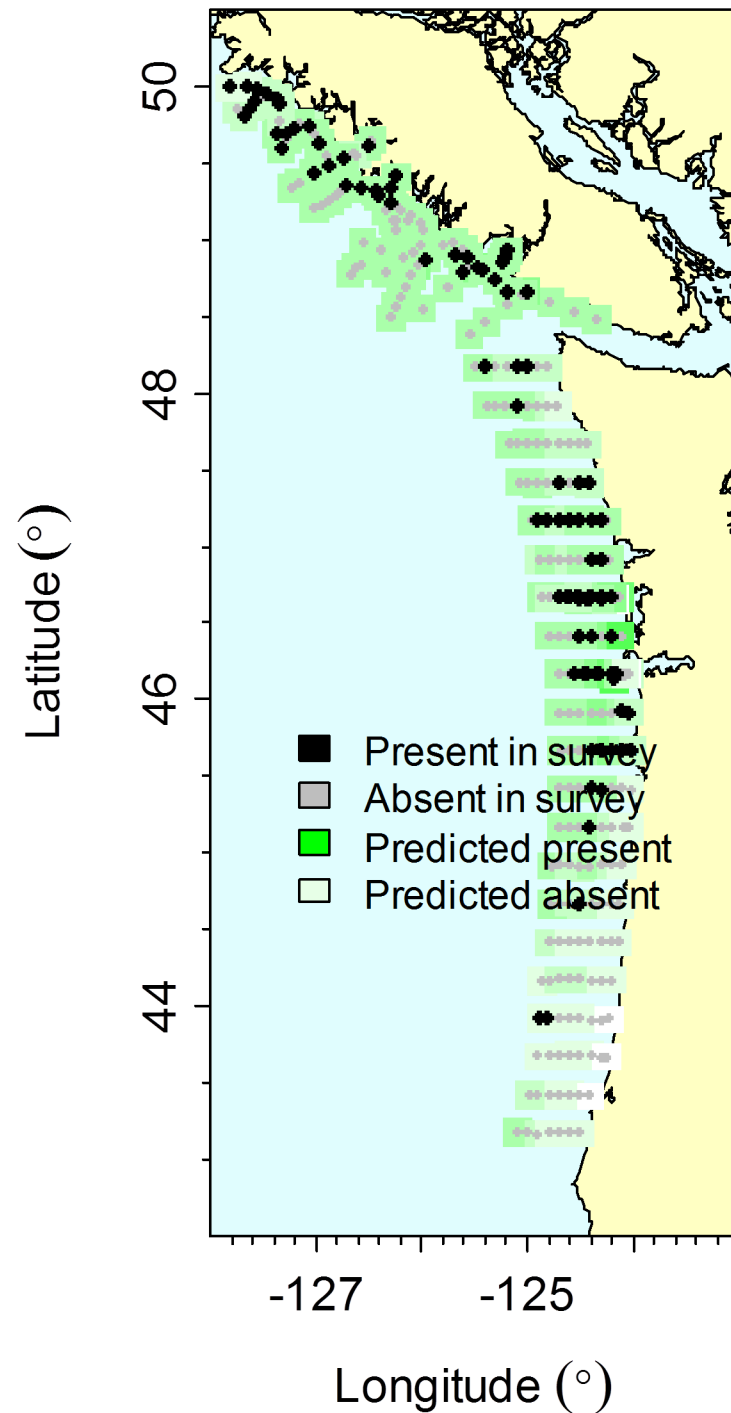
2016 Forecasted
SST Anomaly
(January
Initialized)

Uncertainty
(coefficient of variation as %)

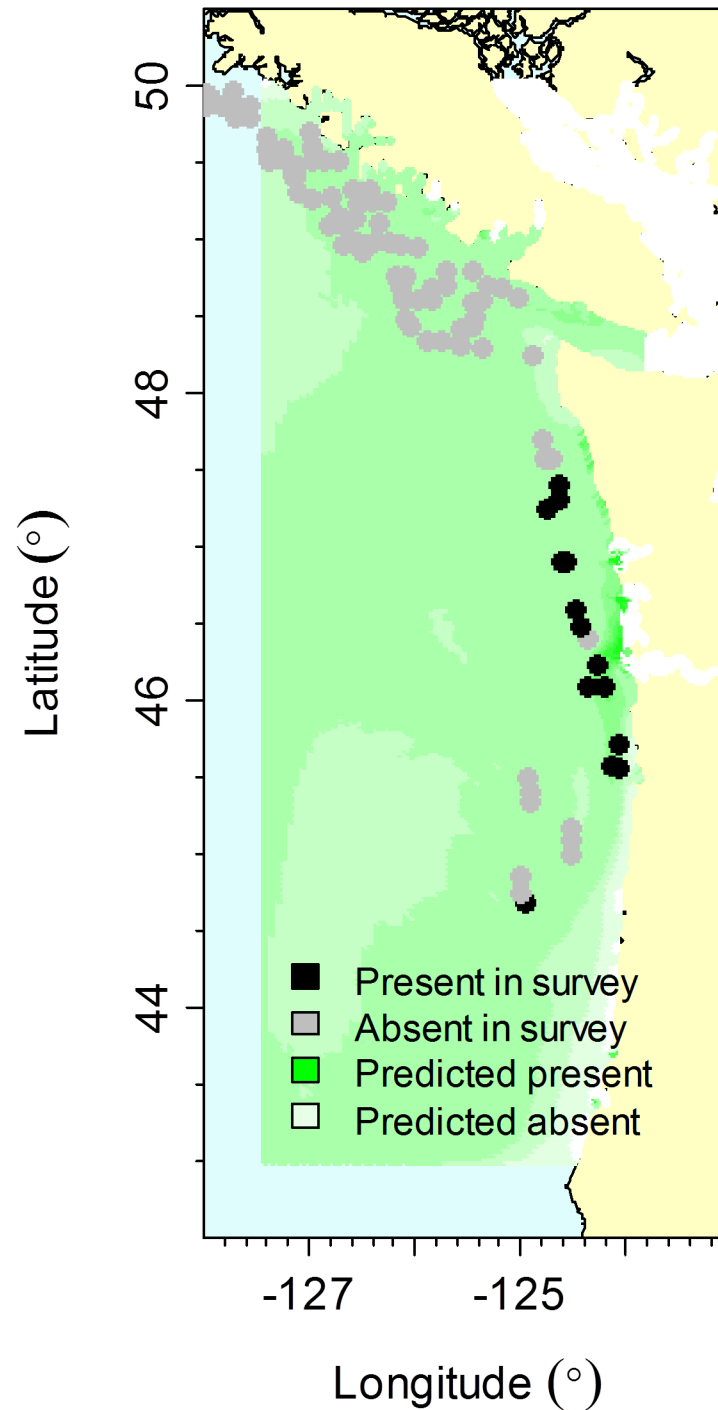


Sardine Forecast

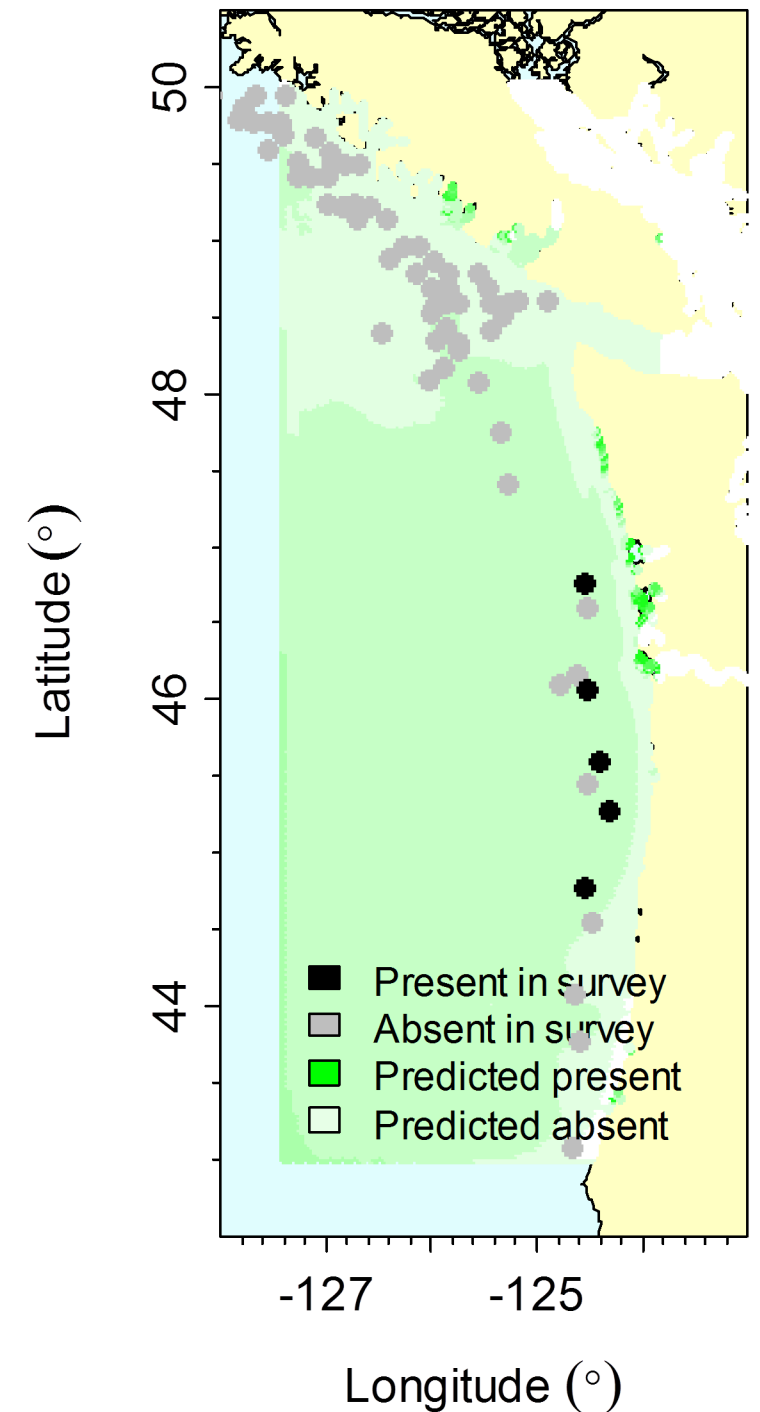
2009



Aug 2013



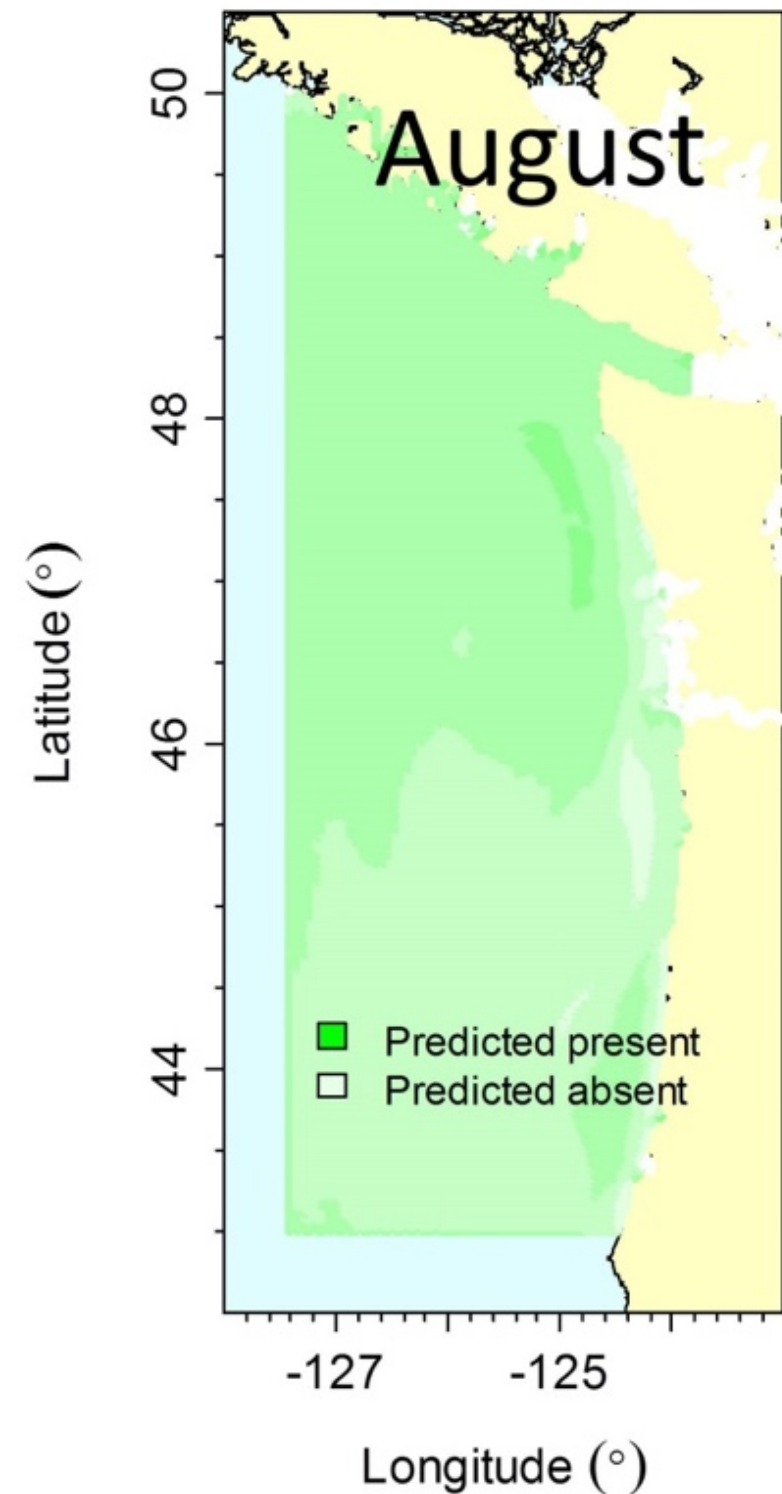
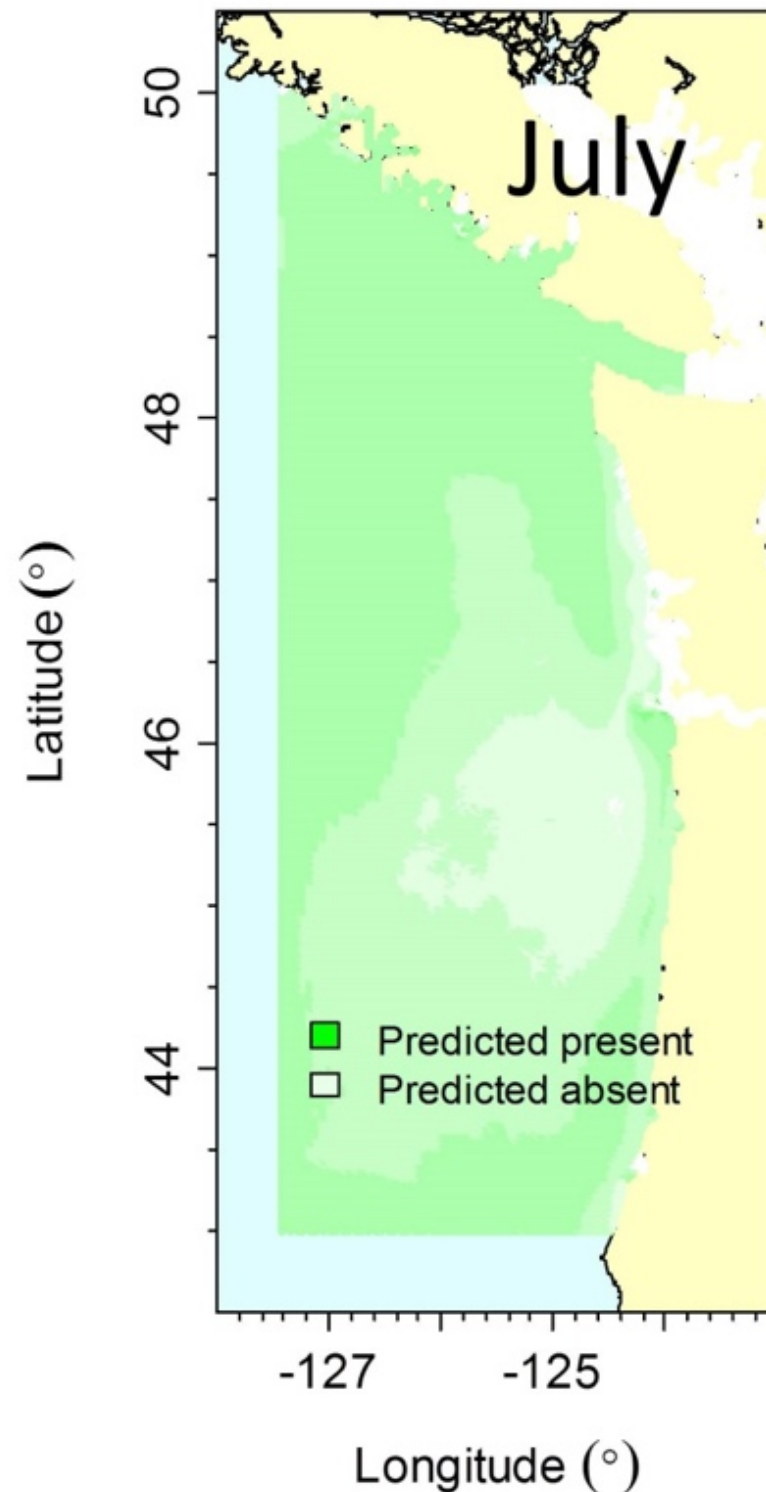
Aug 2014



Kaplan, I. C., Williams, G. D., Bond, N. A., Hermann, A. J. and Siedlecki, S. A. (2016), **Cloudy with a chance of sardines**: forecasting sardine distributions using regional climate models. *Fisheries Oceanography*, 25: 15–27. doi: 10.1111/fog.12131

Sardine predicted present off Canada, but actually absent (2015, 2016)

We can predict sardine distributions with moderate skill, but not very well for 2015-2016

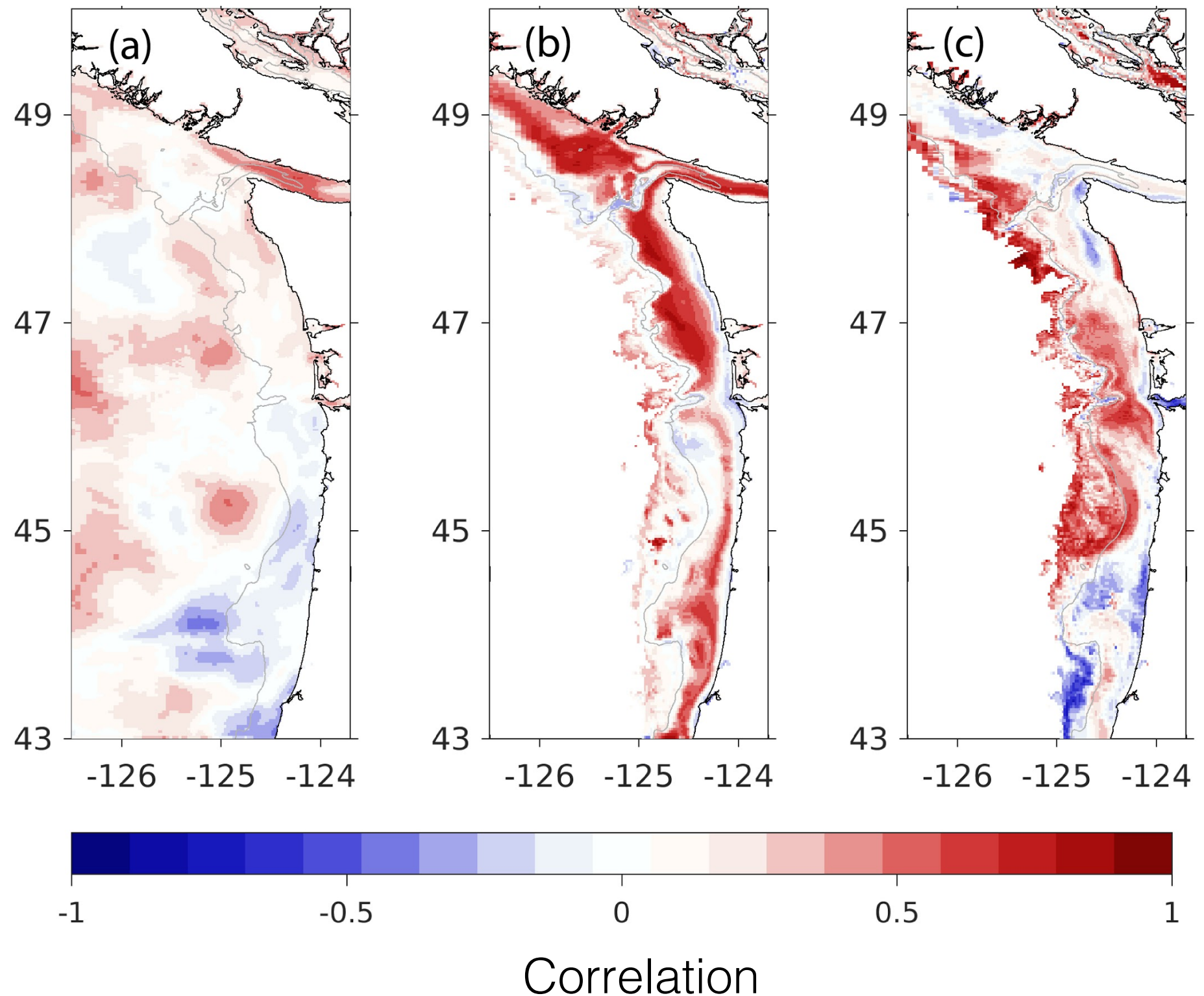


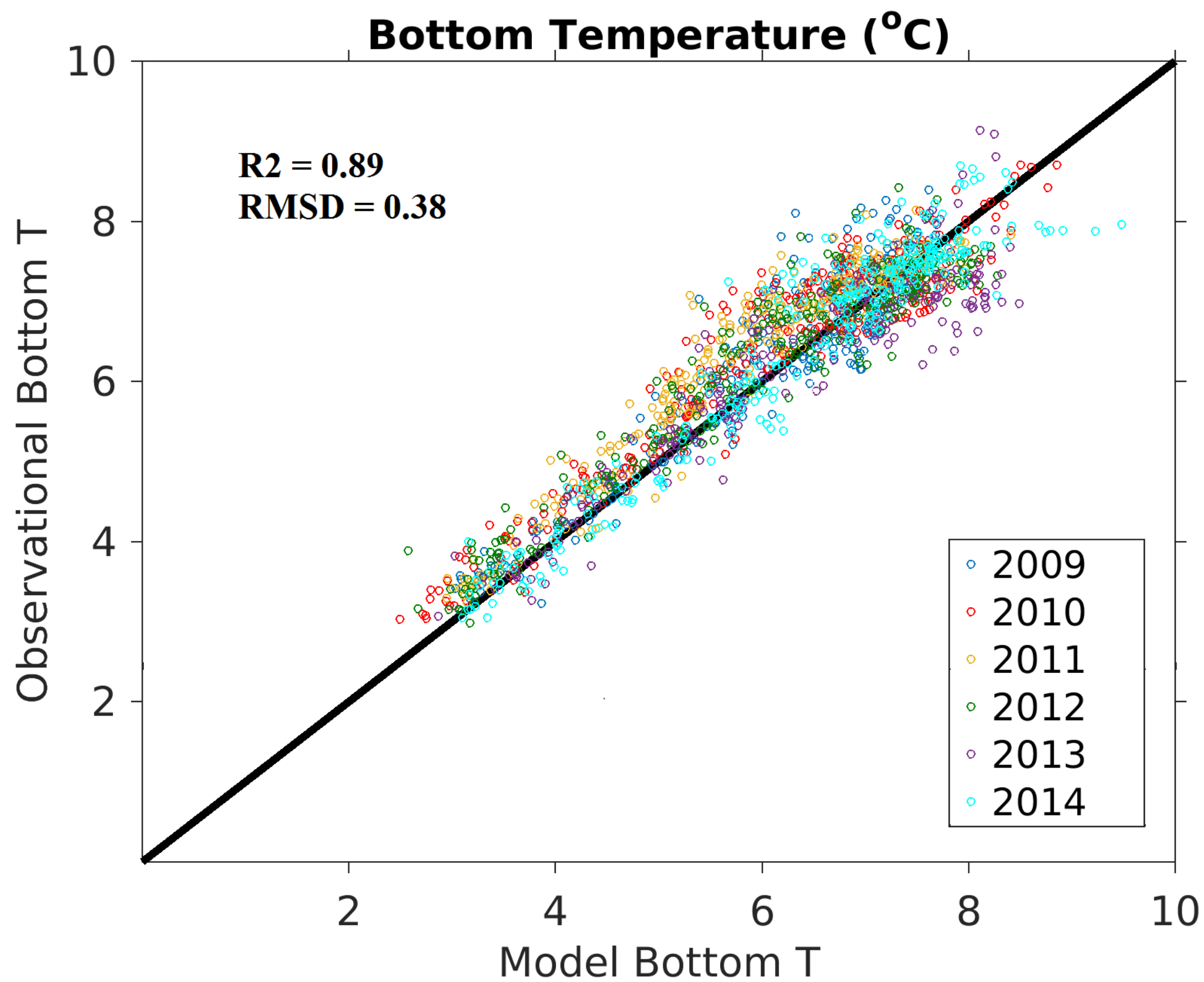
We have better skill to predict bottom conditions (temperature, O2) than SST

Sea surface temp

Bottom temp

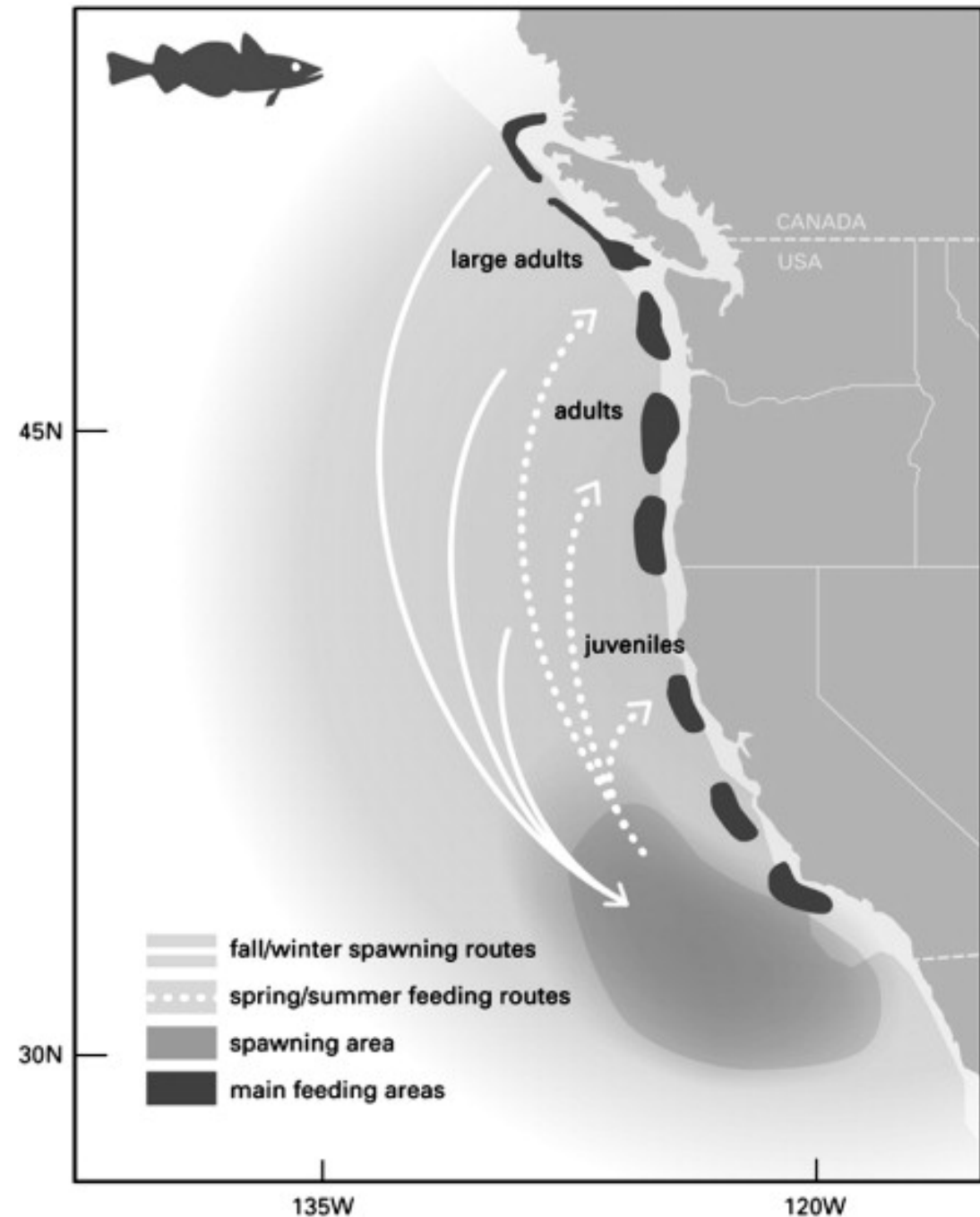
Bottom O2





What are key fisheries species that respond to bottom oxygen and temperature?

Hake (\$76 million in 2013)

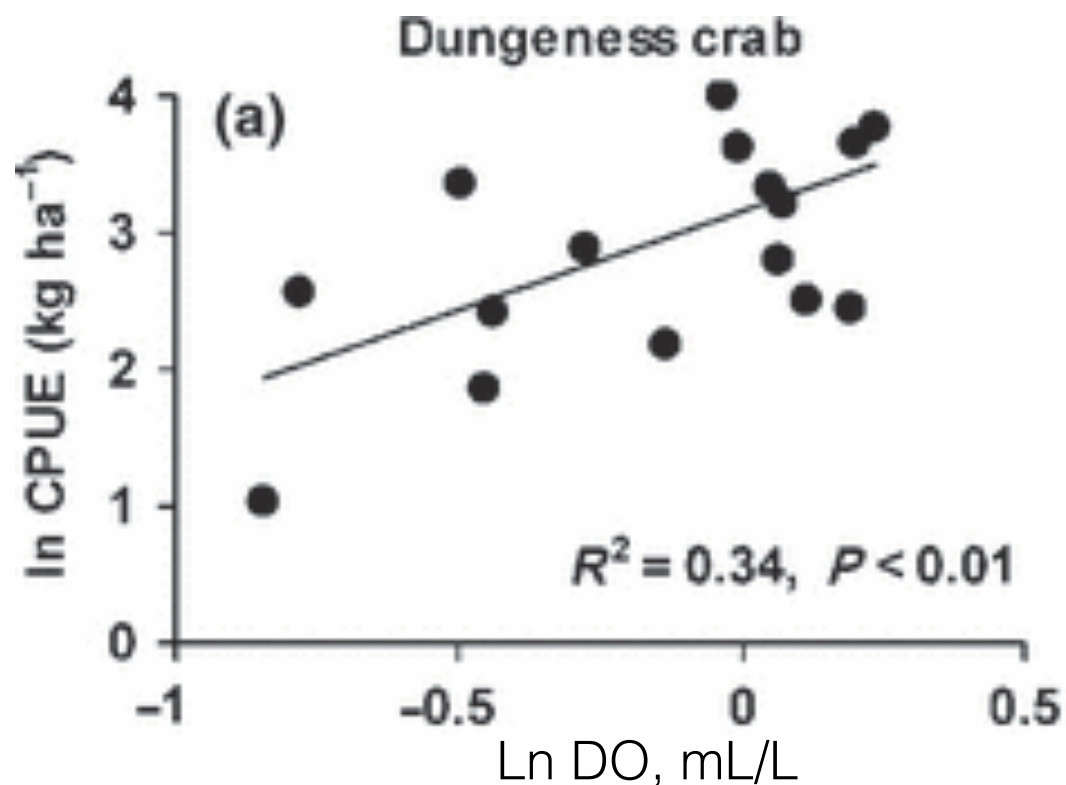


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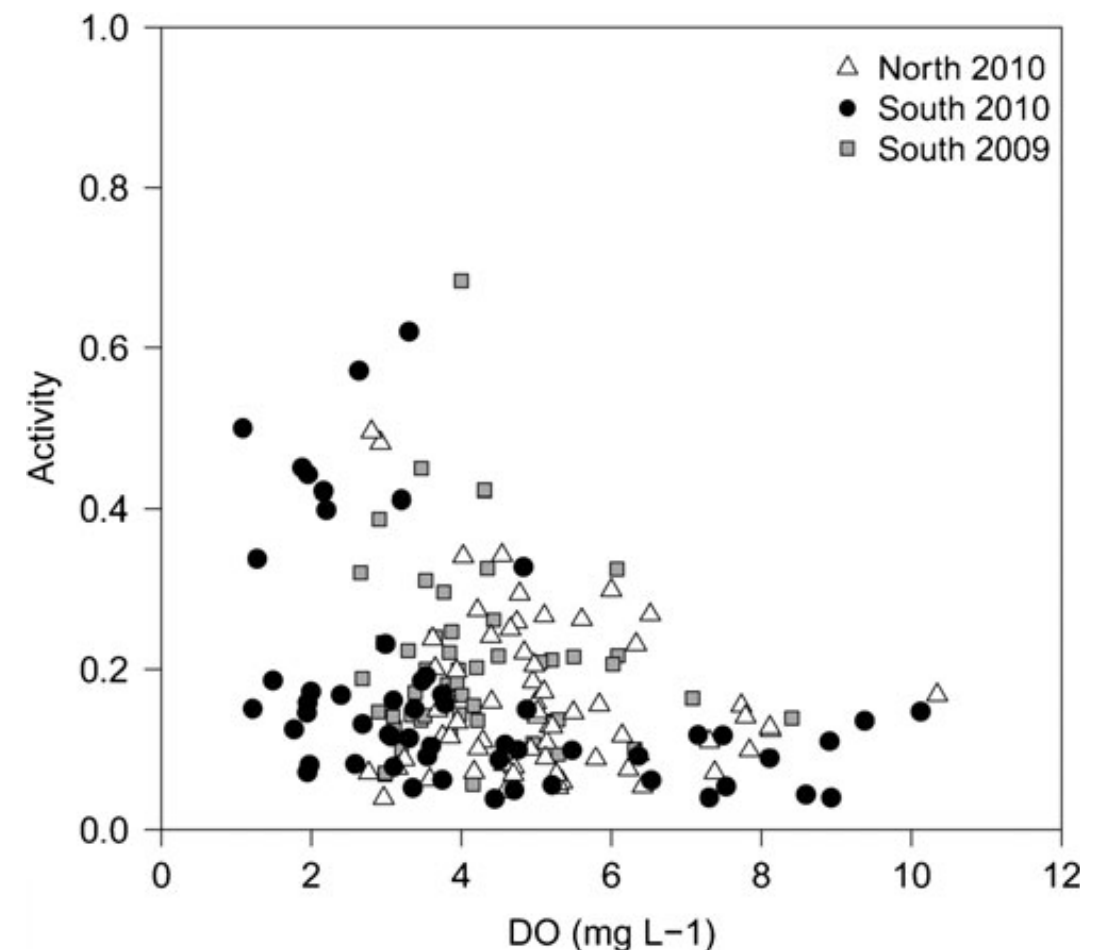


Dungeness crab
(\$220 million on the
West Coast in 2013)

Dead crabs on the beach (J. Lubchenco)



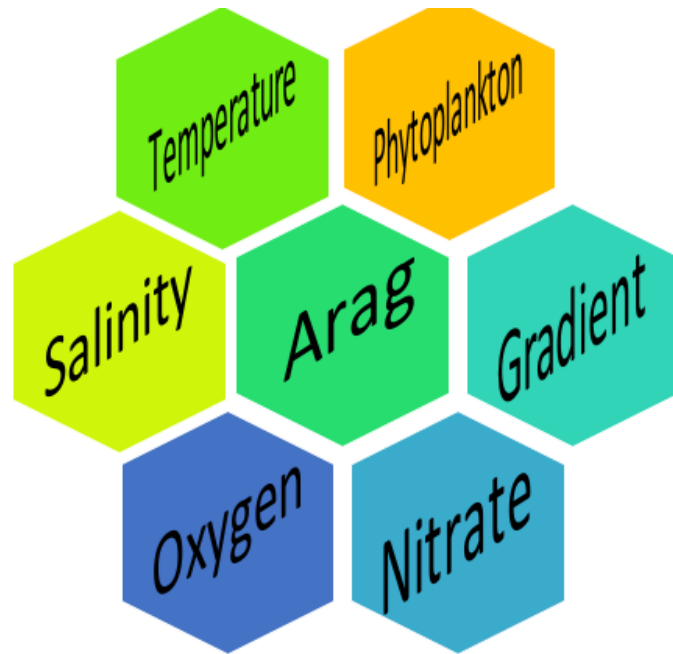
*Keller et al. (2010) Fisheries
Oceanography*



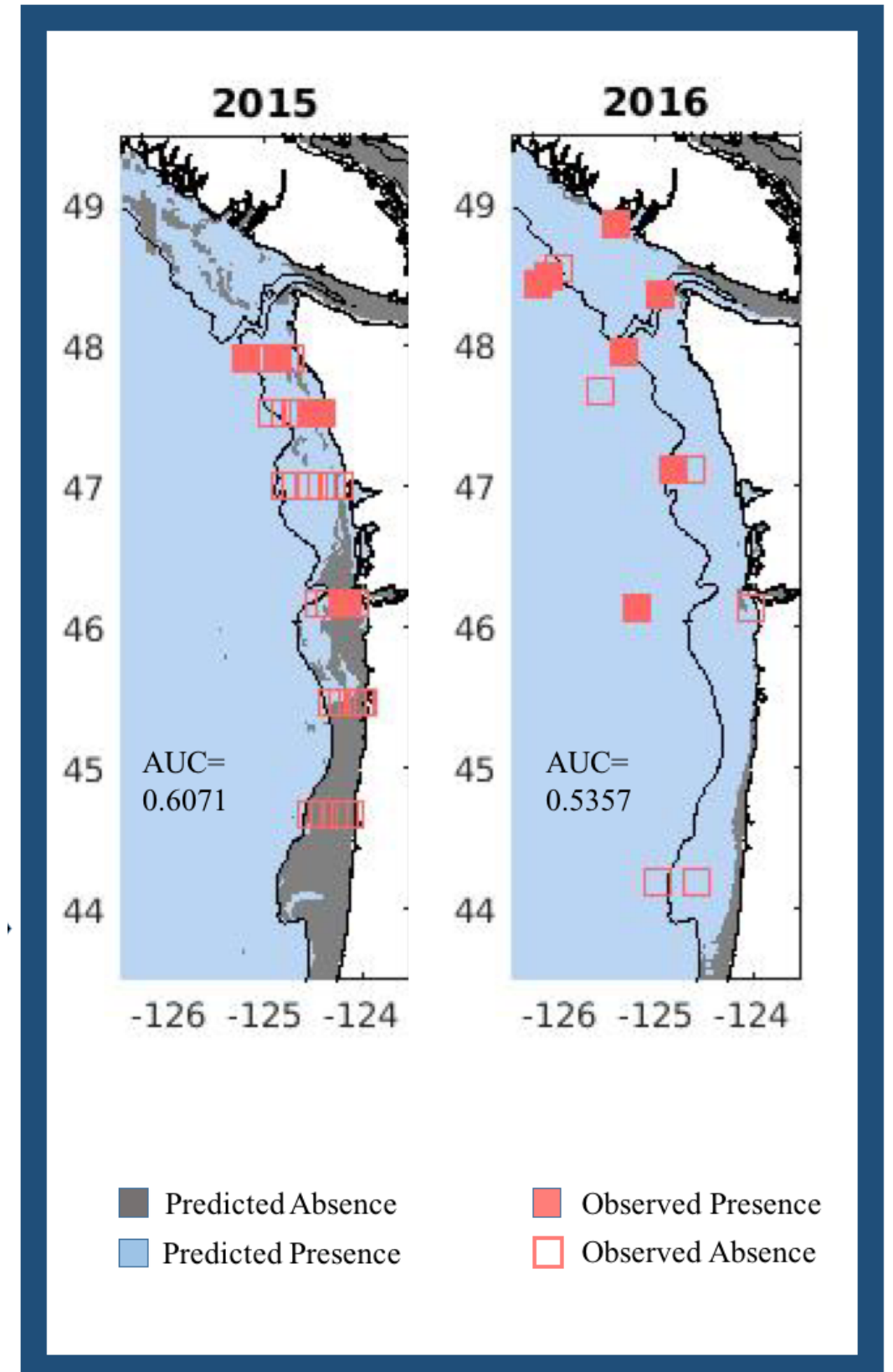
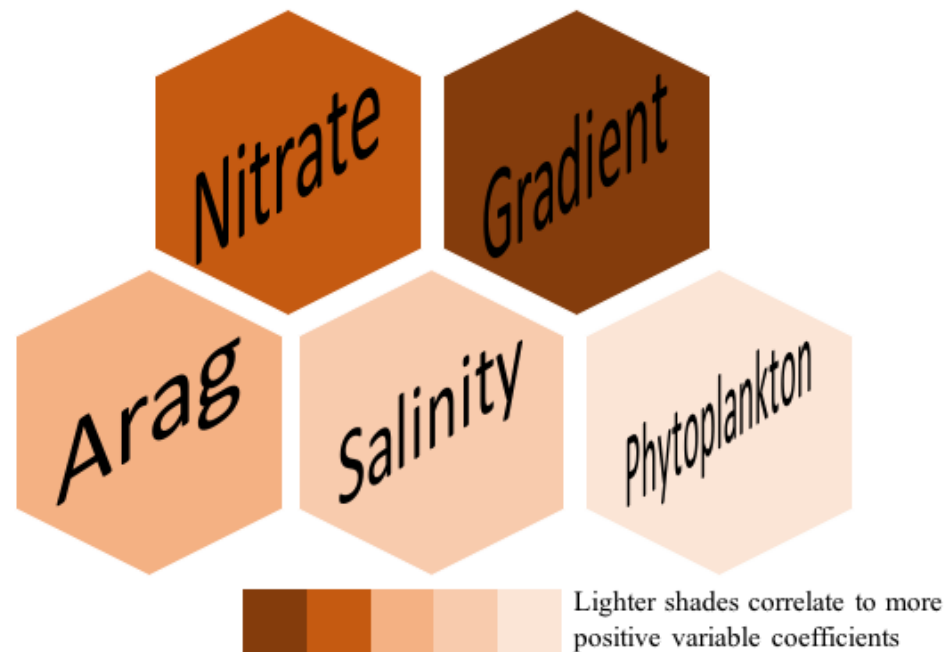
*Froehlich et al. (2013) Estuaries and
Coasts*

Forecasting Dungeness Crab *Megalopae* Distribution using a Generalized Linear Model and J-SCOPE

Forecasts

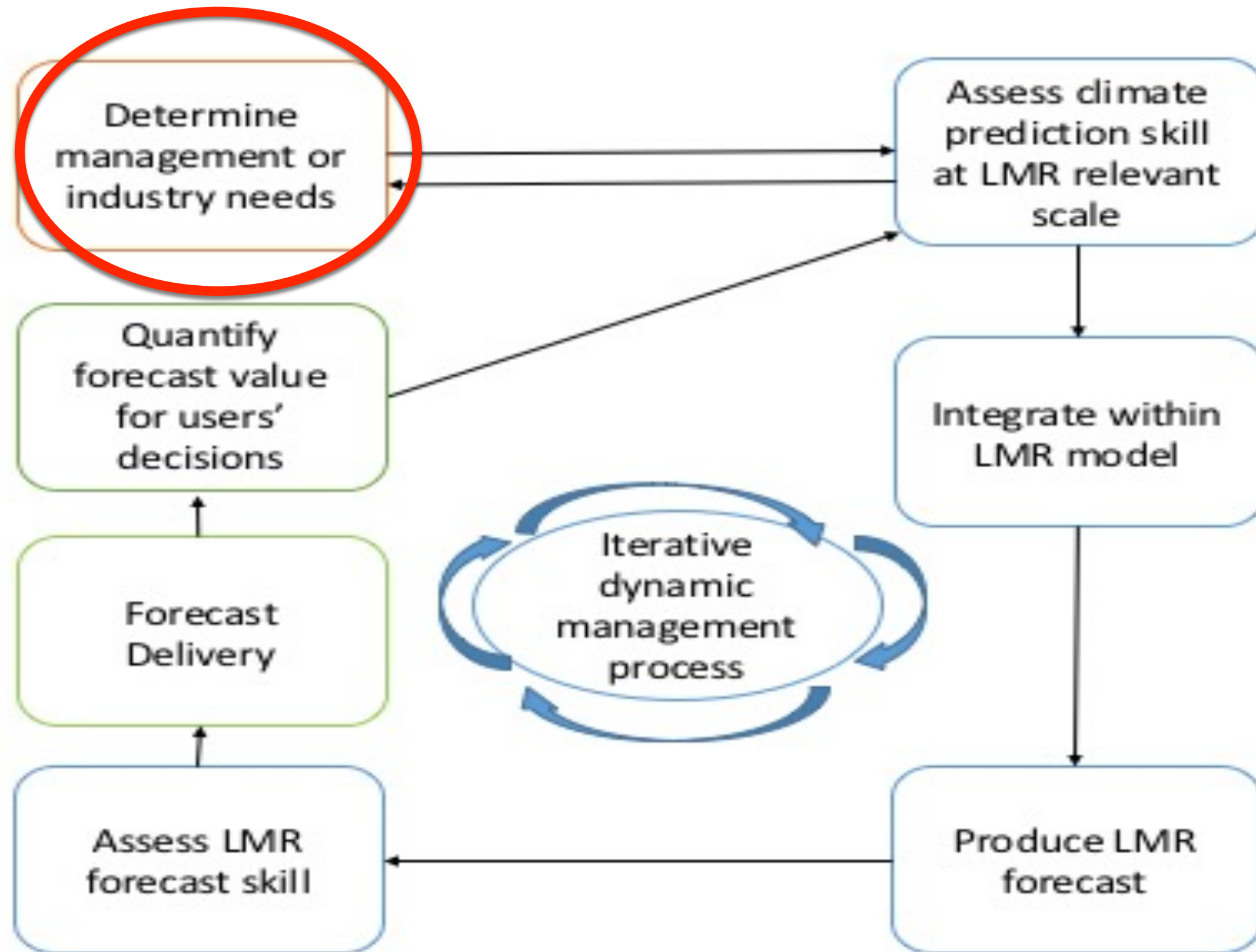


Best Fitting Variable Combination:



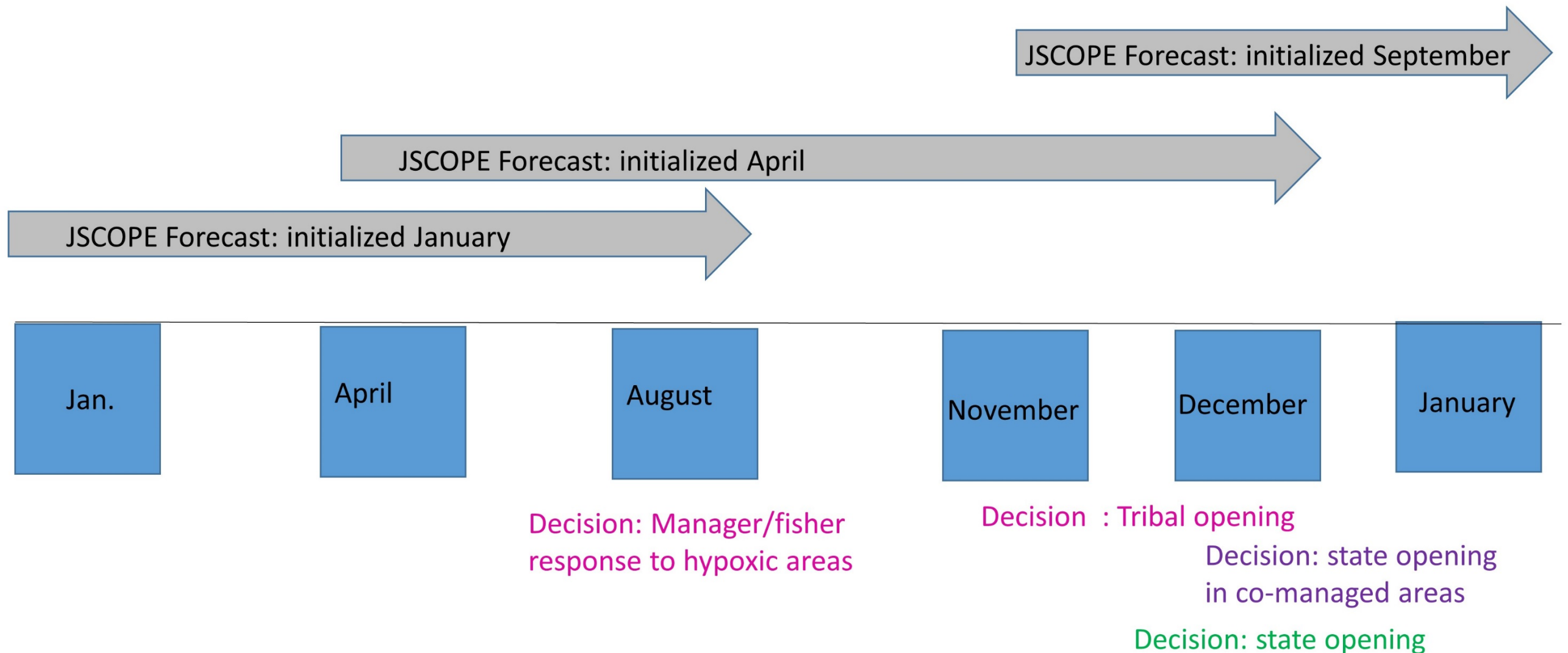
Pilot study by Suzanna Officer

We are focusing forecasts on crab management needs and seasonal decisions



Tomassi et al. (in review), after Hobday et al. 2016

Seasonal decision making by state and tribal managers and Dungeness crab industry



Inspired by : Hobday et al. Fisheries Oceanography 2016



Conclusions

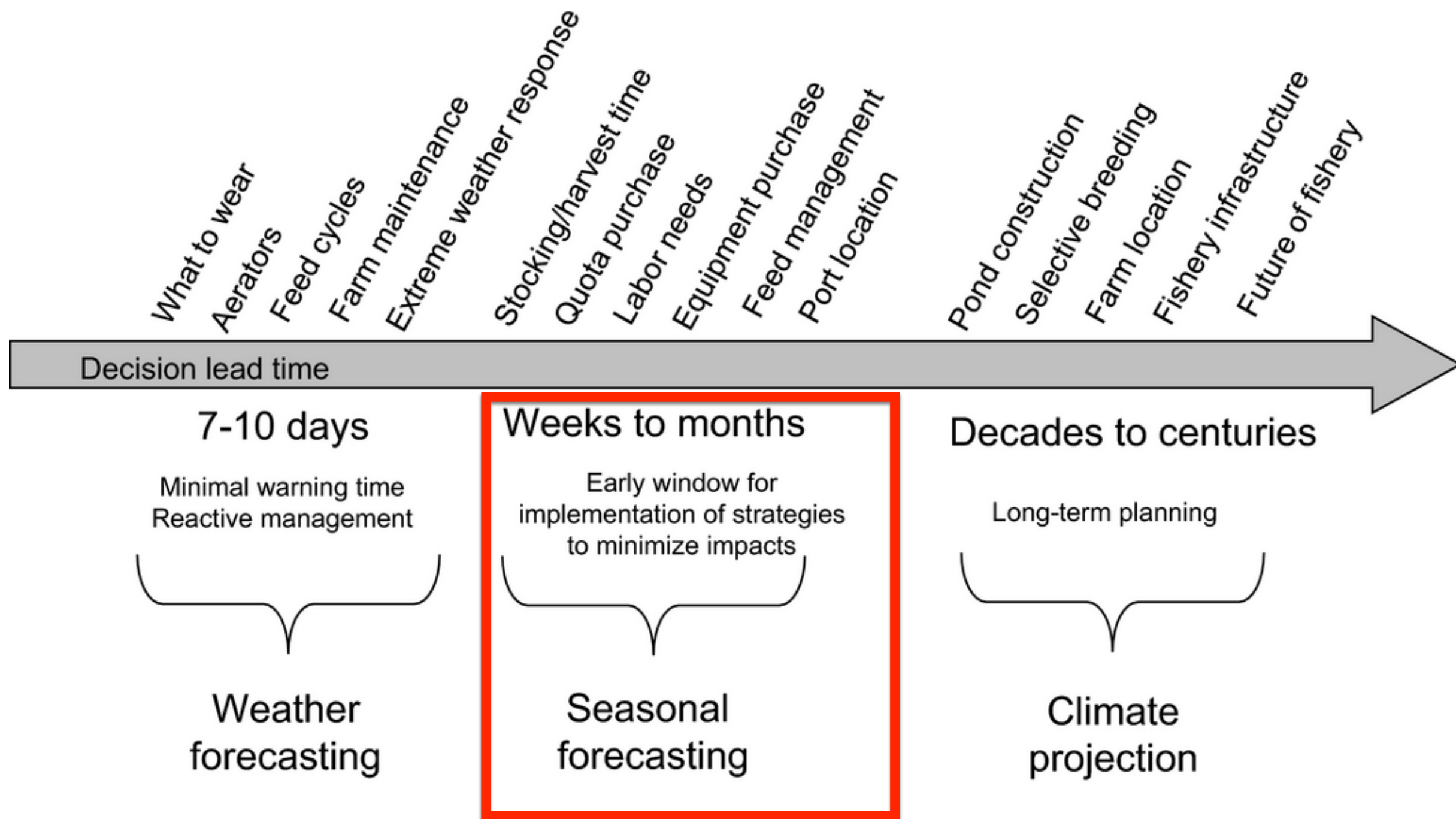
J-SCOPE forecasts (2009, 2013-2014) of subsurface ocean conditions have measurable skill on seasonal timescales, for variables relevant to management decisions for fisheries, protected species and ecosystem health

These forecast are possible through regional downscaling of CFS using ROMS

Forecasting efforts are aided by a relationship with local stakeholders and a real-time observational network

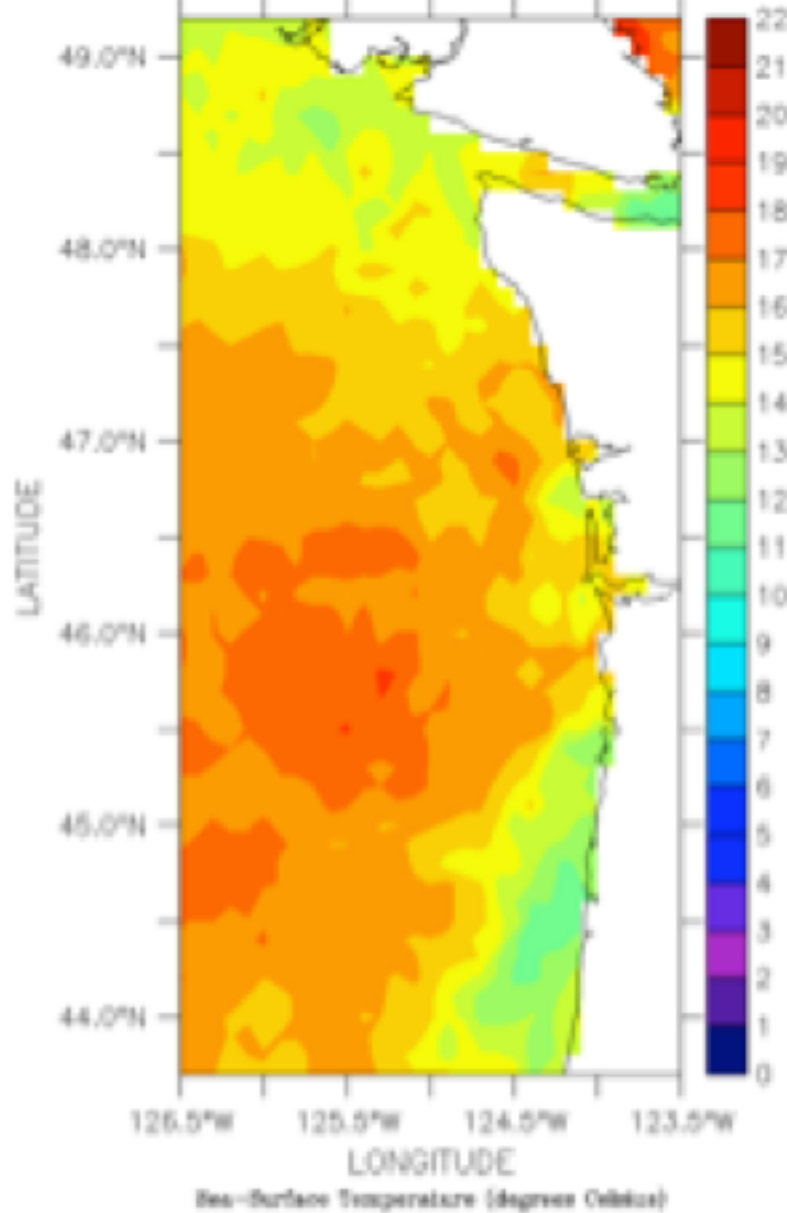
Prediction efforts are focused on species responding to ocean conditions at depth: hake and Dungeness crab

Seasonal forecasting for decision support in marine fisheries and aquaculture

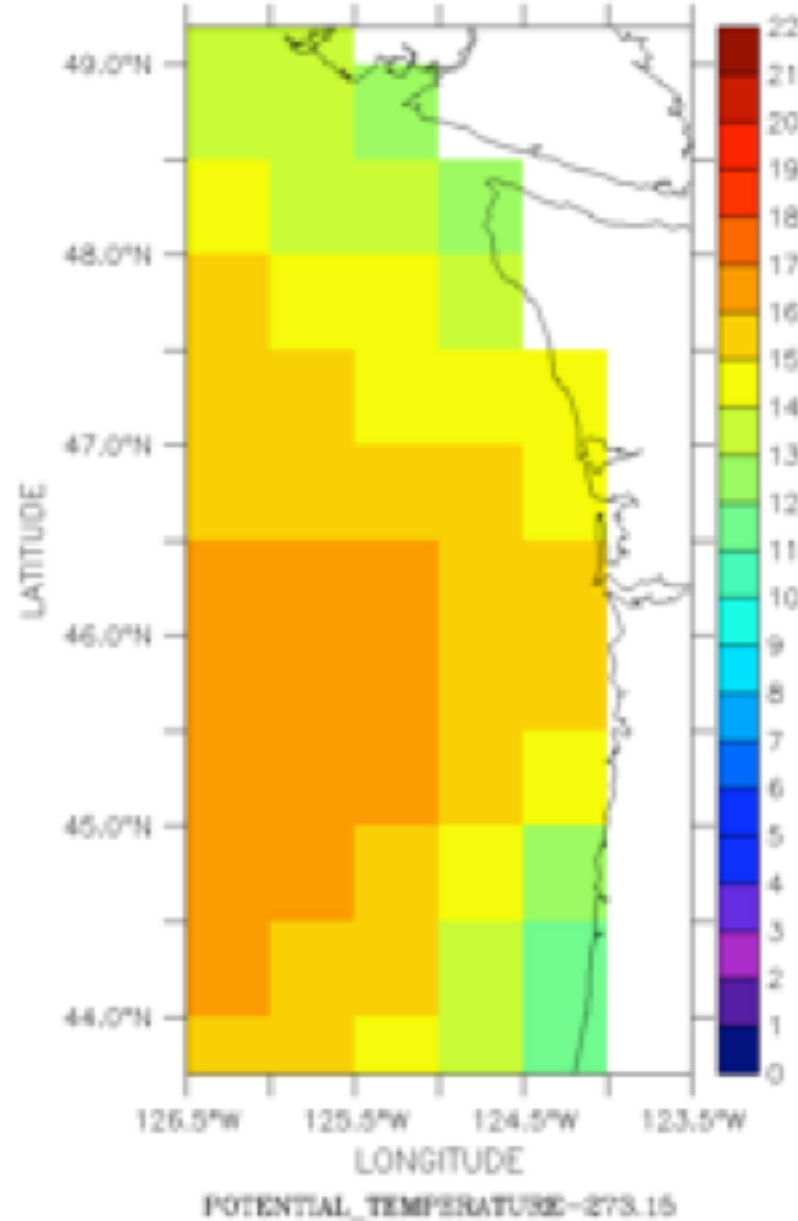


Downscaled model captures N-S and onshore offshore SST trends

Satellite SST



CFS



ROMS Forecast

